

IN THE CLAIMS

1. (Currently amended) An information-processing apparatus for converting information generated by an information generation unit into packets to be transmitted to a network and for receiving packets from said network, said information-processing apparatus comprising:

a means for performing a TCP/IP conversion process to convert information generated by said information generation unit into a TCP/IP packet group to be transmitted to said network;

a management unit for managing FEC (Forward Error Correction) redundancies each provided for a transmission partner connected to said network;

an encoding unit for carrying out an FEC encoding process on said TCP/IP packet group, which has been subjected to said TCP/IP conversion process, by referencing a redundancy held in said management unit for a transmission partner identified in the TCP/IP packet group; and

a decoding unit for carrying out an FEC decoding process on a packet group received from said network;

wherein said management unit has a table stored in a memory, and a redundancy cataloged in said table for each

transmission partner is changed in accordance with a state of packet loss determined for said transmission partner for which said redundancy has been cataloged.

2. (Canceled)

3. (Previously presented) An information-processing apparatus according to claim 1, wherein:

said information-processing apparatus is a storage apparatus having a disk drive in said information generation unit;

said means for performing a TCP/IP conversion process to convert information generated by said information generation unit into a TCP/IP packet group is an iSCSI-protocol processing means;

said encoding unit encodes an iSCSI packet group; and

said decoding unit carries out a decoding process on said packet group received from said network in order to produce an iSCSI packet group.

4. (Previously presented) An information-processing apparatus according to claim 1, wherein data completing an FEC

encoding process in said encoding unit is transmitted to said network as a UDP packet group, and the UDP packet group received from said network is subjected to an FEC decoding process carried out by said decoding unit.

5. (Previously presented) A repeater for transmitting and receiving packet data through a port on a side of a network and a port on a side of a storage apparatus, said repeater comprising:

a transmission management table used for cataloging and managing FEC redundancies each provided for a transmission destination connected to said network;

a reception management table used for cataloging and managing FEC redundancies each provided for a transmission source connected to said network;

an encoding unit for carrying out an FEC encoding process on iSCSI-layer data, which has been generated by a storage apparatus in the form of packets, and providing said data with an FEC redundancy cataloged for a transmission destination by referencing said transmission management table; and

a decoding unit for carrying out an FEC decoding process on packet data, which has been received from said network, by

referencing said reception management table in order to restore said iSCSI-layer data.

6. (Previously presented) A repeater according to claim 5, wherein:

said transmission management table is a table also used for cataloging an address of each transmission destination capable of carrying out an FEC process;

said reception management table is a table also used for cataloging an address of each transmission source capable of carrying out an FEC process;

if the address of a transmission destination is found to have been cataloged in said transmission management table in reference to said transmission management table, iSCSI data is subjected to said FEC encoding process in said encoding unit and transmitted to said network;

if the address of a transmission destination is found to have not been cataloged in said transmission management table in reference to said transmission management table, iSCSI data is transmitted to said network without being subjected to said FEC encoding process in said encoding unit;

if the address of a transmission source transmitting packet data received from said network is found to have been cataloged in said reception management table in reference to said reception management table, said packet data is subjected to said FEC decoding process in said decoding unit in order to restore said iSCSI data; and

if the address of a transmission source transmitting packet data received from said network is found to have not been cataloged in said reception management table in reference to said reception management table, said packet data is transferred to an iSCSI layer without being subjected to said FEC decoding process.

7. (Original) A repeater according to claim 5, further comprising a means for changing information cataloged in said transmission management table and information cataloged in said reception management table by analyzing contents of a control frame received from said network in order to add or delete an address to or from said transmission management table or said reception management table.

8. (Previously presented) A communication method for transmitting data from an apparatus adopting an iSCSI protocol to another apparatus adopting said iSCSI protocol, said communication method comprising:

a first communication mode for transmitting and receiving data in an FEC communication mode;

a second communication mode for transmitting and receiving data in a TCP/IP communication mode;

cataloging iSCSI Names each representing a partner, which serves as a data-communication destination, in a memory and managing said iSCSI Names;

cataloging FEC redundancies each provided for a data-communication destination in a memory and managing said FEC redundancies;

forming a judgment as to whether or not a specific iSCSI Name of a specific partner serving as a specific data-communication destination has been cataloged in said memory;

carrying out an FEC process, which is based upon said FEC redundancy cataloged for said specific data-communication destination in said memory, on data to be transmitted and transmitting said data completing said FEC process to said specific data-communication destination in said first

communication mode if an outcome of said judgment indicates that said specific iSCSI Name has been cataloged in said memory; and

transmitting said data to be transmitted to said specific data-communication destination in said second communication mode in a case where an outcome of said judgment indicates that said specific iSCSI Name has not been cataloged in said memory.

9. (Original) A communication method according to claim 8, further comprising:

finding a loss ratio of transmitted packets for each data-communication destination and managing said loss ratios; and

changing said redundancy cataloged for a particular data-communication destination in said redundancy memory in accordance with said loss ratio found for said particular data-communication destination.

10. (Previously presented) A communication method according to claim 8, further comprising:

cataloging FEC redundancies each provided for a data-communication destination in a memory and managing said FEC redundancies in an apparatus on a reception side;

forming a judgment as to whether or not the iSCSI Name of a specific transmission source has been cataloged in said memory in a process to receive specific data; and

carrying out a restoration process to convert said specific data into iSCSI data on the basis of said FEC redundancy cataloged for said specific transmission source in said memory if an outcome of said judgment indicates that the iSCSI Name of said specific transmission source has been cataloged in said memory.

11. (Original) A communication method according to claim 8, further comprising:

transmitting an ACK to a transmission source in response to transmitted data if iSCSI data can be restored in an apparatus on a reception side or transmitting no ACK to a transmission source in response to transmitted data if iSCSI data cannot be restored in an apparatus on a reception side; and

carrying out an FEC process on the same data as said transmitted data and retransmitting said data completing said FEC process in said first communication mode to the same apparatus as said apparatus on said reception side if no ACK is received by an apparatus serving as said transmission source.

12. (Previously presented) A storage system comprising a plurality of storage apparatus connected to each other by a network, by way of which data is exchanged among said storage apparatus, each of said storage apparatus comprising:

- a disk drive for recording data;
- a disk adapter connected to said disk drive;
- a cache memory connected to said disk adapter;
- a channel adapter connected to said cache memory;
- a means for carrying out a conversion process to convert data originated from said disk drive into an iSCSI packet group conforming to a TCP/IP;
- a management unit for managing FEC (Forward Error Correction) redundancies each provided for a transmission partner;

an encoding unit for carrying out an FEC encoding process on said iSCSI packet group resulting from said conversion process and conforming to said TCP/IP by referencing said redundancy held for a transmission partner in said management unit; and

a decoding unit for carrying out an FEC decoding process on information included in a packet group received from said network.

13. (Original) A storage system wherein data is exchanged through a network among storage apparatus each comprising: an application layer for recording and processing data; an iSCSI layer for carrying out an SCSI process on data of said application layer; and TCP and IP layers for carrying out a TCP/IP process on data of said iSCSI layer,

said storage system comprising:

an FEC encoding process layer for carrying out an encoding process to add a redundancy code to data from said iSCSI layer;

a UDP layer for carrying out a UDP process on data completing said encoding process; and

an IP layer for carrying out an IP process on data from said UDP layer.

14. (Original) A storage system according to claim 13, further comprising an FEC decoding process layer for decoding data coming from said network, completing said IP process at said IP layer and completing said UDP process at said UDP layer.

15. (Original) A storage system according to claim 13, further comprising a means for changing redundancy of a redundant code to a value suitable for a transmission destination at said FEC encoding process layer.

16. (Original) A communication method for transmitting data by way of a network from an apparatus adopting an iSCSI protocol to another apparatus adopting said iSCSI protocol, said communication method comprising:

a first communication mode for transmitting and receiving data in an FEC communication mode including an FEC process;

a second communication mode for transmitting and receiving data in a TCP/IP communication mode;

forming a judgment as to whether or not a partner serving as a data communication destination has an iSCSI layer on the basis of an iSCSI Name;

carrying out an FEC process based upon an FEC redundancy provided for a communication partner on data to be transmitted and transmitting the data completing said FEC process to said partner in said first communication mode to said partner in a case where an outcome of said judgment indicates that said partner has an iSCSI layer; and

transmitting the data to a communication partner in said second communication mode in a case where an outcome of said judgment indicates that said partner does not have an iSCSI layer.

17. (Previously presented) A storage system according to claim 12, wherein:

 said conversion means, said management unit, said encoding unit and said decoding unit are accommodated in an FEC conversion adapter; and

 said FEC conversion adapter is connected to said channel adapter through an interface.

18. (Original) A storage system according to claim 12, wherein said storage system has a duplicate component of each of said disk drive, said disk adapter, said cache memory, said channel adapter and said FEC conversion adapter.

19. (Original) A storage system according to claim 12, further comprising a server for management use connected to a network, wherein said server issues commands to add and delete transmission destinations' addresses controlled by said management unit.

20. (Original) A repeater according to claim 5, further comprising a table used for cataloging an iSCSI Name of each data transmission destination, wherein an FEC communication is permitted in a transmission of data to a specific data transmission destination only if the iSCSI Name of said specific data transmission destination has been cataloged in said table.

REPLY

The Applicants request reconsideration of the rejection.

Claims 1 and 3-20 remain pending.

Claims 1-2 and 4 were rejected under 35 U.S.C. 102(b) as being anticipated by Schuster et al., U.S. 6,243,846 (Schuster). The Applicants traverse as follows.

At the outset, the Applicants thank the Examiner for the effort expended to explain in greater detail the asserted application of Schuster to the rejected claims. After having carefully considered the Examiner's comments, however, the Applicants continue to assert the patentability of the claims as finally rejected.

Nevertheless, to expedite the allowance of the claims, the subject matter of Claim 2 has been added to Claim 1 as shown above. The amended Claim 1 is believed to more clearly contrast with the disclosure of Schuster as follows.

As rejected, Claim 1 recited an information-processing apparatus for converting information generated by an information generation unit into packets to be transmitted to a network, and for receiving packets from the network, including a management unit for managing FEC (Forward Error Correction) redundancies each provided for a transmission

partner connected to the network. Against this feature, the Examiner cites Schuster as "allow[ing] for FEC processes", citing Column 2, lines 32-43 and Column 17, lines 53-57 of the patent.

In fact, however, the passage of Column 2 simply summarizes Schuster as generating and transmitting into a network one or more Forward Error Correction codes, or parity packets, at least one of which is defined by taking a cross-wise XOR sum of a predetermined number of preceding payload packets, and in turn extracting lost payload from the redundant information and correcting for the loss of multiple packets in a row. The passage from Column 17 discloses that the encoder and decoder processes are preferably operated at transmitting and receiving ends of the network, and they employ such hardware as a transmitting computer terminal, network server, hub or router. Neither passage can be said to disclose or fairly suggest providing FEC redundancies each for a transmission partner connected to the network. Simply "allowing for FEC processes" is not consonant with the scope of the claim.

The importance of the distinction is highlighted by the function of the claimed encoding unit, which carries out the

FEC encoding process by referencing a redundancy held in the management unit for a transmission partner identified in the TCP/IP packet group to be transmitted to the network.

Schuster appears to disclose encoder means (the Examiner cites Column 9, line 20 through Column 10, line 24) relating to the cross-wise XOR sum mentioned in Column 2 as noted above.

Schuster's encoding does not reference a redundancy held for a transmission partner identified in a TCP/IP packet group, however.

Further highlighting the difference is the subject matter added from dependent Claim 2. Claim 1 now further requires the management unit to have a table stored in a memory, and a redundancy cataloged in the table for each transmission partner. Further, the redundancy is changed in accordance with the state of packet loss determined for the transmission partner for which the redundancy has been cataloged. Against this feature, the Examiner cites Schuster as inherently disclosing the storage of catalog redundancies in implementing the FEC through devices. The Examiner cites Column 9, line 20 through Column 16, line 50. However, whether Schuster inherently requires storage of catalog redundancies does not

meet each limitation, and particularly does not meet that the redundancies are cataloged for each transmission partner.

Further, any valid "inherency" does not include that the redundancy for each transmission partner is changed in accordance with a state of packet loss determined for the transmission partner. The passage cited by the Examiner appears to disclose encoding and decoding at transmission and reception ends, including the transmission and reception of plural parity packets. The parity packets, however, are calculated by sequentially XORing each of k incoming packets (with their lengths appended) according to one of three schemes. Schuster does not disclose that any redundancy is changed in accordance with a state of packet loss, or that any state of packet loss is determined for the transmission partner for which the redundancy has been cataloged. Indeed, the Office Action does not assert that Schuster discloses changing the redundancy for any reason.

Claims 3 and 5-20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Schuster in view of Chui, U.S. 2002/0165978 (Chui). The Applicants traverse as follows.

Claim 3 is dependent from amended Claim 1 and thus inherits its patentable features discussed above. Chui does

not disclose the claimed management unit or encoding unit; the cataloging of redundancies; or the change of a cataloged redundancy for each transmission partner in accordance with a state of packet loss determined for the transmission partner for which the redundancy has been cataloged.

Further, Claim 3 recites that the means for performing a TCP/IP conversion process is an iSCSI-protocol processing means, and that the encoding unit and decoding unit encode and decode, respectively, an iSCSI packet group. Chui is cited as teaching the "existence" of iSCSI devices. Respectfully, the Applicants do not assert to be the first to invent iSCSI devices. Rather, the present invention has particular applicability in a network environment having an iSCSI layer. Neither Schuster nor Chui discloses a motivation to add Chui's iSCSI devices to the system of Schuster.

In this regard, the Applicants note the assertion in the Office Action that the person of ordinary skill would combine Schuster with Chui "to provide a highly reliable, highly available, and highly scalable system," citing Paragraph 28 of Chui. However, neither Paragraph 28 nor the remaining disclosure of Chui describes how to implement iSCSI devices

according to Chui in the system of Schuster in order to achieve the presently-claimed invention.

The repeater of independent of Claim 5 also includes an encoding unit and a decoding unit for carrying out encoding and decoding, respectively, respecting iSCSI-layer data. Further, Claim 5 recites a transmission management table used for cataloging FEC redundancies each provided for a transmission destination connected to the network; a reception management table used for cataloging and managing FEC redundancies each provided for a transmission source connected to the network; that the encoding unit provides encoded data with an FEC redundancy cataloged for a transmission destination by referencing the transmission management table; and that the decoding unit references the reception management table in order to restore the iSCSI-layer data. As noted above, the requirement to provide each redundancy for the transmission destination (and in the case of decoding, for each transmission source) is not shown by either Schuster or Chui, or by their combination.

Dependent Claim 6 requires the transmission management table to be used for cataloging an address of each transmission destination capable of carrying out an FEC

process, and the reception management table to be used for cataloging an address of each transmission source capable of carrying out an FEC process. If the address of the transmission destination is cataloged, the iSCSI data is subjected to the FEC encoding process and transmitted to the network, but if the address is not cataloged, the iSCSI data is transmitted without being subjected to the FEC encoding process. Moreover, if the address of the transmission source is cataloged, the packet data is subjected to the decoding process, but if not cataloged, the packet data is transferred to the iSCSI layer without being subjected to FEC decoding. The rejection does not assert, and neither reference discloses, a transmission management table or reception management table that catalogs the addresses of the transmission destinations and transmission sources, respectively, and neither reference discloses or suggests the alternative transmission and reception with or without FEC encoding/decoding based on whether the address of the destination or source is cataloged. Rather, the rejection over-broadly asserts the "inherency" of storing transmission and reception "data", without explaining how the person of

ordinary skill would know to modify such broad teachings into the claimed invention.

Dependent Claim 7 further recites a means for changing information cataloged in the transmission management table and information cataloged in the reception management table by analyzing contents of a control frame received from the network in order to add or delete an address to or from the transmission management table or the reception management table. Again, neither Schuster nor Chui discloses the storing of addresses in a transmission management table or reception management table as claimed, and thus there can be no disclosure of means for changing information cataloged in these tables by analyzing contents of a control frame in order to add or delete an address therefrom. Moreover, the rejection does not address this feature of the claim, but merely rejects the claim out-of-hand by repeating grounds for other rejections.

Independent Claim 8 recites a communication method for transmitting data from an apparatus adopting an iSCSI protocol to another apparatus adopting the iSCSI protocol. The method includes alternative communication modes for transmitting and receiving data in FEC or TCP/IP communication modes. Thus, at

the outset, Schuster and Chui do not disclose the invention of Claim 8 because, as noted by the Examiner, Schuster discloses an FEC system that transmits and receives in an FEC communication mode. Schuster does not disclose or fairly suggest a method of communicating using two communication modes, one of which is an FEC communication mode and another of which is a TCP/IP communication mode.

Moreover, although the Office Action alleges that broad statements in Schuster teach specific limitations of the claimed invention, Schuster never discloses cataloging iSCSI names each representing a partner, even in combination with Chui. Further, Schuster does not disclose cataloging names representing a partner serving as a data-communication destination, and managing the names.

Schuster also does not disclose cataloging FEC redundancies each provided for a data-communication destination, and managing the redundancies. Schuster discloses Forward Error Correction and coding using plural parity packets, but they are not "each provided for a data-communication destination".

Schuster also does not disclose a step of forming a judgment as to whether or not a specific iSCSI name of a

specific partner serving as a specific data-communication destination has been cataloged, even in combination with the teachings of Chui. In fact, Schuster does not disclose forming any such judgment regarding a name of a specific partner serving as a specific data-communication destination. Indeed, the Office Action does not assert any passage in Schuster alleged to disclose the formation of such a judgment.

Necessarily, therefore, Schuster cannot be said to teach carrying out an FEC process based upon a redundancy cataloged for a specific destination, and transmitting the data completing the FEC process to the specific destination in the first communication mode if an outcome of the judgment indicates that the specific name has been cataloged. Schuster cannot be said, moreover, to teach transmitting the data in the second communication mode based on the judgment indicating that the specific name has not been cataloged. Accordingly, Claim 8 is also patentable.

Claim 9 limits the communication method of Claim 8 by a step of finding a loss ratio of transmitted packets for each data-communication destination and managing the loss ratios, and a step of changing the redundancy cataloged for a particular data-communication destination in the redundancy

memory in accordance with the loss ratio for the particular data-communication destination. Again, neither Schuster nor Chui discloses the finding of a loss ratio, management of such loss ratios, or changing the redundancy for any reason, let alone in accordance with a loss ratio found for a particular destination. Indeed, the Office Action does not assert these features to be specifically found in Schuster or Chui.

Claim 10 recites steps of cataloging FEC redundancies each provided for a data-communication destination and managing the FEC redundancies on a reception side. Neither Schuster nor Chui disclose such cataloging, particularly on the reception side, and the Office Action does not appear to consider the limitation in forming the rejection.

Further, claim 10 recites a step of forming a judgment as to whether a specific transmission source has been cataloged in a process to receive specific data. However, neither Schuster nor Chui discloses this step, and the Office Action does not address the step by showing more than a broad allegation that the step is known from the combination of Schuster and Chui.

Claim 10 also recites carrying out a restoration process on the basis of the cataloged FEC redundancy for the specific

transmission source if the outcome of the judgment is that the iSCSI Name is cataloged. However, neither Schuster nor Chui mentions judgment, and the Office Action does not point to a corresponding disclosure.

Independent claim 12 recites a storage system having a management unit for managing FEC redundancies each provided for a transmission partner, an encoding unit for carrying out an FEC encoding process by referencing a redundancy held for transmission partner, and a decoding unit for carrying out an FEC decoding process on the information received from the network. For reason similar to those advanced above, claim 12 is patentable because neither Schuster nor Chui discloses the management of FEC redundancies each provided for specific transmission partners.

Claim 13 is directed to a storage system including an FEC encoding process layer to add a redundancy code to data from an iSCSI layer, a UDP layer for carrying out a UDP process on data, and an IP layer for carrying out an IP process on data from the UDP layer. Although Schuster appears to reference these three types of layers, neither Schuster nor its combination with Chui is seen to disclose all three in the combination claimed.

Claim 15 is patentable as reciting means for changing redundancy of a redundant code to a value suitable for a transmission destination at the FEC encoding process layer. As noted above, no reference of record discloses to change the redundancy based on transmission destination.

Claim 16 is directed to a communication method having first and second communication modes as discussed above with respect to claim 8. On this basis alone, then, claim 16 is patentable.

Furthermore, claim 16 recites a step of forming a judgment as to whether a partner serving as a data communication destination has an iSCSI layer, on the basis of an iSCSI name; a step of carrying out an FEC process based on an FEC redundancy and on the judgment; and a step of transmitting the data to a communication partner in either the first communication mode or the second communication mode depending on the judgment. Neither Schuster nor Chui teaches these features of claim 16, and the Office Action does not adequately address them in the rejection.

Claim 17 is dependent from claim 12, and thus inherits its patentable features. In addition, claim 17 requires the conversion means, management unit, encoding unit, and decoding

unit to all be in an FEC conversion adapter connected to a channel adapter through an interface. It is not seen how the Examiner finds these features in the combination rejection, simply by alleging "inherency" and making broad assertions as to the storage and transmission of data, encoded and then decoded.

Similarly, claim 18 is limited by the duplicate provision of the disk drive, disk adapter, cache memory, channel adapter, and FEC conversion adapter, but is rejected on seemingly irrelevant grounds.

Claim 19 is also dependent from claim 12, and requires a server to issue commands to add and delete the addresses of transmission destinations under control of the management unit. The rejection also does not address this limitation.

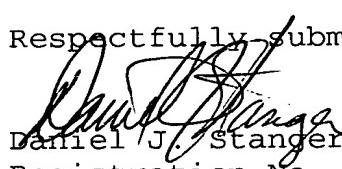
Finally, claim 20, dependent from claim 5, recites a table that catalogs an iSCSI name of each destination, wherein an FEC communication is permitted in a transmission of data to a specific data transmission destination only if the iSCSI name of the specific data transmission destination is cataloged in the table. Again, the rejection does not sufficiently address the limitations of the claim.

In fact, numerous claims are dismissed in the Office

Action with insufficient reference to specific teachings and, as noted above, without truly addressing the limitations of the claims in any defensible manner.

In view of the foregoing amendments and remarks, the Applicants request reconsideration of the rejection and allowance of the claims.

Respectfully submitted,


Daniel J. Stanger
Registration No. 32,846
Attorney for Applicants

MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C.
1800 Diagonal Road, Suite 370
Alexandria, Virginia 22314
(703) 684-1120
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